Solubility, Immiscibility, and Critical Phenomena in Ternary Water-Salt Systems

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There are three main types of ternary water-salt systems in which solids coexist with supercritical fluid phases. One type of ternary systems is distinguished by the continuous increasing of salt solubility with temperature in the three-phase equilibrium (L-G-S), by the absence of critical phenomena in saturated aqueous solutions (L=G-S), and by negative temperature coefficient of salt solubility (t.c.s.). These phase equilibria, spreading from one or two boundary binary systems, are present in ternary water-salt mixtures of the other types. In most cases of such ternary systems the sign of the t.c.s. is changed from negative to positive in the limit of euthonic solution behavior, as soon as a general concentration of solution has reached the composition of transitional region where the "waterlike" behavior of hydrothermal solution properties changes to the "meltlike" one.

Available experimental data on hydrothermal systems show the examples of main types of fluid phase behavior, described by the classification system of Van Konynenburg and Scott (1980), and permit observation of the transformations and disappearance of immiscibility regions as well as the appearance of tricritical phenomena in ternary aqueous solutions.

Particular attention will be given to the influence of the metastable immiscibility region on the shape of three-phase solubility surface (L-G-S), including the case of the transition of the three-phase immiscibility region (L_1-L_2-G) from metastable to stable conditions, and to the critical behavior of ternary aqueous solutions around a tricritical point.